15 June 1964

Project 9051

Design Specifications - Gamma I Printer

This specification clarifies the Design Specification dated 10 April 1963 in the area of resolution and accuracy limits. The clarifications do not alter or reduce the original design specification in any manner, but serve only to expand upon the description of the specified limits.

The specifications are as follows:

1. Input Specifications

Focal length	24 inches
Film length	500 feet
Film width	70 mm (58 mm format)
Scan angle (primary)	70°
Roll range	$\pm 5^{\circ}$
Primary tilt angle	15°
Primary tilt range	$\pm 5^{\circ}$
Maximum input resolution	200 lines per millimeter
Format and fiducial orientation	To be supplied by contracting agency
Camera altitude	Variable (To be supplied by contracting agency)

2. Rectifier Output Specifications

Format size	Full format (not segmented) on $9\frac{1}{2}$ inch wide film. The easel shall accommodate full format with $\pm$ 5 degrees roll.
Optimum Output Scale	1.875X magnification at center of format
Auxiliary data to be recorded	The data block contained on the input format shall be printed to the same scale as the format image. The exact location and dimensions of this data block is to be provided by the contracting agency.

Earth curvature	To be compensated for by an adjustable radius easel with sufficient range to cover the altitude range specified. Each easel setting shall require an adjustment of the lens focus cam to reduce resolution degradation. The easel adjustments shall be calibrated for convenient settings.
Focus cam	A three-dimensional lens focus cam shall be provided to adjust the lens for sharp focus throughout the 70° sweep range to compensate for the change in projection distances resulting from the adjustable easel. The focus cam will allow 5 degree overrun on either side providing for optimum focus throughout an 80° sweep range. However, the resolution requirement of 50 l/mm shall apply to the primary sweep angle of $\pm 35^{\circ}$. The surface of the cam shall be generated by straight lines connecting three calibrated contour planes but it will not be locally contoured to correct for any minor lens or optical flaws. The three calibrated contours shall correspond to the minimum, nominal, and maximum altitudes.
Primary tilt range	+ 10 degrees to + 20 degrees
Total tilt range	- 5 degrees to + 20 degrees. The equipment will have the physical capability of accommodating this total tilt range, but the resolution requirements (80 to 50 l/mm) and accuracy requirements (0.010 inch at the easel) will apply only within the primary tilt range (+ 10 degrees to + 20 degrees).
Roll	Easel length and input format will be based on $\pm$ 5 degrees roll to produce the full print; however, the fiducial offset will accommodate $\pm$ 10 degrees roll.
Resolution	The resolution capability shall be 80 l/mm at nadir across the width of format and no less than 50 l/mm at any point on the format. These values are referred to the negative scale and printed on duplicating film (emulsion type 5427). The resolving capability shall apply for any setting of the easel tilt from $+ 10^{\circ}$ to $+ 20^{\circ}$ combined with the calibrated settings of easel curvature and associated lens focus cam as specified. The design goal is to maintain this resolution over the total physical tilt range from $- 5^{\circ}$ to $+ 20^{\circ}$ and for all settings of easel curvature.
Accuracy	The accuracy of the output shall be 0.010 inch and shall approach a design goal of 0.005 inch with no error greater than 0.010 inch. The accuracy will apply within the limits of the 50 l/mm resolution requirement as specified under "Resolution".

Accuracy (cont'd.)	The accuracy of the printer shall be tested with constructed grids to duplicate taking case pitched panoramic displacements. These grids are to be supplied by the contracting agency. The projection of the grids through the rectifier with the proper settings shall be measured and compared with the true rectified positions.
Film support (input format)	Rollers or other suitable means shall be provided to support the input film in its proper plane at the exposure point throughout the entire 70° sweep range.
Orientation of input film	A means of aligning the input fiducial coincident with the rectifier optical axis shall be provided. A positive calibrated means shall be provided for displacing this reference mark by $\pm 10^{\circ}$ from the rectifier optical axis.
Variable magnification	The equipment shall be designed to provide a means for displacing the easel from its optimum focus position by a measured amount sufficient to alter the output scale by $\pm$ 1%. This displacement may be either in the plus or minus direction from the optimum focus position; however, the resolution and accuracy specified under "Resolution" and "Accuracy" shall apply only at the optimum focus position.
Negative transport	Manual - The film transport system (i.e., rollers, platen, etc.) shall be designed to prevent damage (i.e., scratches, abrasions) to the 70 mm input film. The capacity shall be 500 feet.
Copy transport	Automatic - The film transport system shall be designed to prevent damage to the 9½ inch wide output film. The capacity shall be 500 feet. No take-up cassettes shall be provided.
Exposure control	An automatic means shall be provided for controlling the exposure during sweep to compensate for the changing projection distance.
Light source	The light source and condensing system shall be designed to provide sufficient illumination at the input negative to allow exposure times to be in the optimum range (10 to 60 seconds) when printing from negatives with density ranges varying from 0.2 to 1.4. The lamp head shall be provided with convenient adjustments to allow the operator to align the lamp filament in its proper relationship to the condensing lens system. A method or means (possibly in the form of a small screen which would snap onto the bottom of the condensing lens) shall be provided to assist the operator in this alignment.

Slide rule computer	A manual means shall be provided to assist the operator in determining displacements, angles, and other required instrument settings.

STAT

[redacted]

11-79706
79767
76968

STAT

1" per minute on Separate [redacted]

(10-60
scan)

SPECIAL HANDLING

SHC63-3140-157 (9051.03)

Copy # 4

18 April 1963

203/63

Gentlemen:

STAT [ ] is pleased to submit this proposal covering the design and production of a Gamma I Rectifying Printer.

STAT This proposal constitutes [ ] formal bid for the work outlined and the specifications found in Section I of our proposal. From a contract standpoint, this proposal constitutes a bid for a CPFF Contract substantially in accordance with ASPR and AFPI provisions in existence as of date of contract.

The fee claim is in the amount of 8% total estimating cost. Further, our prices are conditioned on the following items of considerations:

1. The prices shown for production quantities of Instruments Nos. 2, 3, and 4 are valid for a period of 45 days after which time, STAT [ ] reserves the right to amend.
2. The FOB points for all items is [ ] STAT and costs for delivery, as directed by the contracting officer to points other than the stipulated FOB, will be handled in accordance with the changes article cited in the contract.
3. That the GFE will be supplied to [ ] STAT in a manner and quantity as listed below:
   a. 70mm resolution targets supplied under Production List 62-3 of Contract [ ] STAT are to be provided in a quantity and type sufficient to meet the testing requirement imposed by the contract.
   b. That the contracting officer will supply four (4) each 9½" x 500' rolls of Type 5427 duplicating film within 90 days of the date of contract award.
4. That the cost of additional units over and above four (4) each will be at the price quoted in Section II of our proposal for Instrument No. 4.
5. That final acceptance testing of instruments will be conducted at contractor's plant; installation costs for equipment at location other than Washington, D. C., which may result at the request of contracting officer, will be handled under the changes article of the contract.

SPECIAL HANDLING

6. Our prices do not contain federal, state, or local taxes as none are believed applicable. Furthermore, the above prices do not contain a price or charge for royalties in excess of [redacted]

STAT

We are pleased to have been given the opportunity to submit this proposal and wish to assure you that we intend to exert our best efforts in the performance of all work requirements outlined herein. Should you require any further information regarding this proposal, do not hestitate to call upon us. Please direct any contractual correspondence to [redacted]

STAT

Very truly yours,

[redacted]

STAT

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S E C T I O N I

10 April 1963

Project 9051

Design Specifications - Gamma I Printer

This specification modifies and expands the Design Parameters outlined in the Design Study, Gamma I and II Printers, 9050-1, dated August 17, 1962. The modifications and specifications are as follows:

1. All references to Gamma II are deleted.

2. The "Input Specifications" are:

Focal length	24 inches
Film length	500 feet
Film width	70mm (58mm format)
Scan angle (primary)	70°
Roll range	$\pm 5^{\circ}$
Primary tilt angle	15°
Primary tilt range	$\pm 5^{\circ}$
Maximum input resolution	200 lines per millimeter
Format and fiducial orientation	To be supplied by contracting agency
Camera altitude	Variable (To be supplied by contracting agency)

3. The "Rectifier Output Specifications" are:

Format size	Full format (not segmented) on $9\frac{1}{2}$ inch wide film. The easel shall accommodate full format with $\pm$ 5 degrees roll.
Optimum Output Scale	1.875X magnification at center of format
Auxilliary data to be recorded	The data block contained on the input format shall be printed to the same scale as the format image. The exact location and dimensions of this data block is to be provided by the contracting agency.

Earth curvature	To be compensated for by an adjustable radius easel with sufficient range to cover the altitude range specified. Each easel setting shall require an adjustment of the lens focus cam to reduce resolution degradation. The easel adjustments shall be calibrated for convenient settings.
Focus cam	A three dimensional lens focus cam shall be provided to adjust the lens for sharp focus throughout the 70° sweep range to compensate for the change in projection distances resulting from the adjustable easel. The surface of the cam shall be generated by straight lines connecting three calibrated contour planes but it will not be locally contoured to correct for any minor lens or optical flaws. The three calibrated contours shall correspond to the minimum, nominal, and maximum altitudes.
Primary tilt range	+ 10 degrees to + 20 degrees
Total tilt range	-5° degrees to +20 degrees. The equipment will have the physical capability of accommodating this total tilt range, but the resolution requirements (80 to 50 l/mm) and accuracy requirements (0.010 inch at the easel) will apply only within the primary tilt range (+10 degrees to +20 degrees).
Roll	Easel length and input format will be based on $\pm$ 5 degrees roll to produce the full print, however, the fiducial offset will accommodate $\pm$ 10 degrees roll.
Resolution	The resolution capability shall be 80 l/mm at nadir across the width of format and no less than 50 l/mm at any point on the format. These values are referred to the negative scale and printed on duplicating film (emulsion type 5427). The resolving capability shall apply for any setting of the easel tilt from $+10^{\circ}$ to $+20^{\circ}$ combined with the calibrated settings of easel curvature and associated lens focus cam as specified. The design goal is to maintain this resolution over the total physical tilt range from -5° to $+20^{\circ}$ and for all settings of easel curvature.

Accuracy	The accuracy of the output shall be 0.010 inch and shall approach a design goal of 0.005 inch with no error greater than 0.010 inch. The accuracy of the printer shall be tested with constructed grids to duplicate taking case pitched panoramic displacements. These grids are to be supplied by the contracting agency. The projection of the grids through the rectifier with the proper settings shall be measured and compared with the true rectified positions.
Film support (input format)	Rollers or other suitable means shall be provided to support the input film in its proper plane at the exposure point throughout the entire 70° sweep range.
Orientation of input film	A means of aligning the input fiducial coincident with the rectifier optical axis shall be provided. A positive calibrated means shall be provided for displacing this reference mark by $\pm 10^{\circ}$ from the rectifier optical axis.
Variable magnification	The equipment shall be designed to provide a means for displacing the easel from its optimum focus position by a measured amount sufficient to alter the output scale by $\pm$ 1%. This displacement may be either in the plus or minus direction from the optimum focus position; however, the resolution specified under "Resolution" shall apply only at the optimum focus position.
Negative transport	Manual--The film transport system (i.e., rollers, platen, etc.) shall be designed to prevent damage (i.e., scratches, abrasions) to the 70mm input film. The capacity shall be 500 feet.
Copy transport	Automatic--The film transport system shall be designed to prevent damage to the $9\frac{1}{2}$ inch wide output film. The capacity shall be 500 feet. No take-up cassettes shall be provided.
Exposure control	An automatic means shall be provided for controlling the exposure during sweep to compensate for the changing projection distance.
Light source	The light source and condensing system shall be designed to provide sufficient

Light source (cont.)	illumination at the input negative to allow exposure times to be in the optimum range (10 to 60 seconds) when printing from negatives with density ranges varying from 0.2 to 1.4. The lamp head shall be provided with convenient adjustments to allow the operator to align the lamp filament in its proper relationship to the condensing lens system. A method or means (possibly in the form of a small screen which would snap onto the bottom of the condensing lens) shall be provided to assist the operator in this alignment.
Slide rule computer	A manual means shall be provided to assist the operator in determining displacements, angles and other required instrument settings.

SECTION II

STAT [redacted]

GAMMA - I - QUANTITY OF 1

[redacted] PROPOSAL NO 3140.01 STAT

COST PLUS - FIXED FEE - COST PROPOSAL

DATE: STAT 5 APRIL 1963

Prepared by:
COST AND PRICE ANALYSIS
[redacted]

SECTION III

STAT [redacted]

GAMMA - I - QUANTITY OF 2-3-4

[redacted] PROPOSAL NO. 3140.01 STAT

COST PLUS FIXED FEE COST PROPOSAL

STAT

DATE: 15 APRIL 1963

PREPARED BY:
COST AND PRICE ANALYSIS SECTION

[redacted]